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**Establishment Record for
Old Woman Cove Research Natural
Area within Fishlake National Forest**

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INT-97036-CCSA

ESTABLISHMENT RECORD FOR
OLD WOMAN COVE RESEARCH NATURAL AREA
WITHIN FISHLAKE NATIONAL FOREST
SEVIER COUNTY, UTAH

INTRODUCTION

The Old Woman Plateau lies along the southeastern margin of the Wasatch Plateau, one of a series of plateaus that form a north-south trending zone of highlands through the central part of Utah. The upper elevations of these plateaus are occupied primarily by coniferous forests and herblands, while lower elevations support stands of aspen, sagebrush, mountain mahogany and piñon-juniper. The eastern margin of the Old Woman and Wasatch Plateaus is defined by dramatic cliffs and steep slopes that descend to Castle Valley.

Human activity in this area is thought to have begun with the Paleo-Indians about 13,000 to 10,000 B.C., marking the beginning of the Great Basin cultures. The Fremont people used the area as early as A.D. 450, and were well represented in the lower elevation valleys both to the west and east of the Wasatch Plateau. Although these people were horticulturists with settlements in the valleys, they also ventured onto the higher elevations of the Plateau to hunt and gather. The latest American Indians to occupy this region were the Utes, who were present at the advent of white settlement.

The first known Euro-Americans in this area were explorers and traders using the Spanish Trail, established after the turn of the 19th century. During the 1830's and 1840's this was a well-travelled route, used to transport horses, cattle, furs, and pack trains of merchandise. This trail skirted the Wasatch and Old Woman Plateaus along their eastern and southern margins, passing near present-day Castle Dale and then southward through Salina Canyon. Several U.S. government expeditions also traversed this area while exploring transcontinental routes to Oregon and California.

The present settlement of Castle Valley began in 1877 with the immigration of small groups of Mormon colonists. These people relied to a great extent on natural resources available on the plateaus to their west. In the decade following settlement, coal was mined and timber cut in the canyons and highlands of these plateaus. Raising of domestic livestock was also a primary economic activity for the early settlers. Stocking levels on the plateaus became so high that overgrazing began to cause severe flooding, water contamination, gullying and deteriorating range conditions, all of which generated great public concern.

In order to manage uses and improve land conditions, much of the area of the Wasatch and Old Woman Plateaus was incorporated into Forest Reserves in the early 1900's. The Fishlake National Forest that exists today was consolidated in 1923 from four smaller National Forests (Fishlake, Beaver, Fillmore and Glenwood) that were established from 1899 to 1907. A major part of the Wasatch Plateau was set aside as a Forest Reserve in 1903, with subsequent consolidation resulting in the present-day Manti-LaSal National Forest in 1949.

Many current occupants of the region still draw their livelihood from Forest resources such as forage, water, minerals, timber and recreation. Complementing the multiple use of resources is a need to maintain undisturbed examples of the area's natural diversity. A means of accomplishing this on National Forest lands is through administrative designation of Research Natural Areas (RNAs). These serve to register and protect certain ecosystems as benchmark or reference areas.

A portion of the Old Woman Plateau that adjoins a geographic feature known as The Cove, on the Richfield District of the Fishlake National Forest to the southwest of Emery, has been subject to very little

resource use or development due to its isolated position. A Forest staff member noticed the undisturbed character of the site in the early 1980s, and brought it to the attention of the author of this Establishment Record late in 1984. A joint visit was made to the site in early September 1985, to assess its condition and determine if it met unfilled needs in the RNA system.

This site, referred to as "Old Woman Cove", was found to support virtually pristine forests, woodlands, shrublands and herbaceous communities that are characteristic of these elevations on the Old Woman Plateau. A reconnaissance report from the initial site visit (Tuhy 1986) concluded that the area was worthy of RNA status. Subsequent field visits on which Forest staff were present in 1987, 1994 and 1997 confirmed the RNA qualifications of the Old Woman Cove site. The opportunity therefore exists to recognize and protect its values by designating it as the Old Woman Cove Research Natural Area (OWCRNA).

The Old Woman Cove tract consists entirely of reserved lands of the Fishlake National Forest. It is not within nor does it contain any Congressionally-designated areas such as Wilderness, National Recreation Area or Wild and Scenic River.

Land Management Planning

The Regional Guide for the Intermountain Region (USDA Forest Service 1984) includes policy, general guidance, and Regional planning requirements for RNAs. The more recent Regional Desk Guide (USDA Forest Service 1993) reiterates that selection and establishment of RNAs shall be a part of the continuing land and resource management planning process. Relevant portions of these Regional documents are included in Appendix A.

The Fishlake National Forest Land and Resource Management Plan ("Forest Plan"; USDA Forest Service 1986b) and Environmental Impact Statement (USDA Forest Service 1986a) contain more-specific policy and guidance for the establishment and management of RNAs on the Forest. Selected materials pertaining to RNAs from these two documents are included in Appendix B.

The Old Woman Cove site was nominated as a candidate RNA as part of the continuing management planning process. However, it is not identified as a candidate RNA in the current Forest Plan. At present, the Forest Plan identifies the area as being within Management Area 6B, where intensive grazing management systems are favored over extensive systems and where conflicts between livestock and wildlife are resolved in favor of livestock. As explained later in this Record, however, use of the Old Woman Cove site by domestic livestock is negligible, and conflicts between livestock and wildlife (or other resources) are virtually non-existent.

The environmental analysis and recommendations necessary for designating the Old Woman Cove site as an RNA are contained within an Environmental Assessment (USDA Forest Service 1998b; Appendix C) and Fishlake National Forest Plan Amendment (USDA Forest Service 1998a; Appendix D). The result of these analyses and the subsequent decision is to change the status of the Old Woman Cove site to Management Area 10A, a Research Natural Area.

OBJECTIVES

✓ The chief objective of the Old Woman Cove RNA is to preserve and maintain in undisturbed, naturally-functioning condition the biological and genetic diversity present within a number of exemplary terrestrial vegetation types and habitat occurrences within the area. These include examples of coniferous forest, woodland, shrubland and herbaceous vegetation communities plus distinctive landform, soil and geologic types.

Establishment and protection of the OWCRNA will further the long-term objective of setting aside at least one example of all the habitat or vegetation community types represented on National Forest lands in Utah or Region 4 (Federal Committee on Ecological Reserves [FCER] 1977). As explained in the following section, the OWCRNA contains six vegetation types that would be new to the RNA system within the Utah High Plateaus and Mountains geographic Section, and five types that would add desired redundancy to the system.

The OWCRNA will also provide a reasonably accessible reference site for basic, non-manipulative studies of biotic patterns, ecological processes, natural disturbance regimes, and community succession. Left undisturbed by human intrusions, it will afford managers and conservation scientists a benchmark for assessing long-term ecological and geomorphological changes, plus inherent productivity (Passey et al. 1982). Such a benchmark would be especially useful for comparing the effects of resource management techniques and practices on grazed or timbered lands nearby, and likely elsewhere on the Utah High Plateaus (Johnson 1989).

JUSTIFICATION STATEMENT FOR ESTABLISHMENT OF AREA

An initial estimate of RNA needs in Utah and Nevada found that cells typical of the Utah high plateaus were outstanding deficiencies in the RNA system (Van Pelt 1982, Table 25b). Some of these cells have been filled since the date of that initial estimate, via designation of RNAs such as Red Canyon, Table Cliff, Timbered Cinder Cone (Dixie National Forest); Bullion Canyon, Upper Fish Creek (Fishlake National Forest); and Nelson Mountain (Manti-La Sal National Forest).

A recent analysis of RNA needs on National Forest lands in Utah (Tuhy 1998) focused on vegetation types as the cells to be targeted for inclusion in the RNA system, segregated according to geographic divisions of the state known as Sections (McNab and Avers 1994). This analysis found that designation of the OWCRNA would fill six new cells within the Utah High Plateaus and Mountains Section, and provide desired redundancy for five more cells. Table 1 shows the specific cells that are represented in the OWCRNA, and what they bring to the RNA system.

Pertinent excerpts from the initial RNA needs estimate (Van Pelt 1982) and from the recent analysis (Tuhy 1998) are included in Appendix E, as documentation of the needed natural diversity elements.

Designation of the OWCRNA would also add a number of landform and geologic cells to the RNA system, according to the classifications in FCER (1977; pp. 14-19). Because these cell categories are not well-defined within the FCER document, however, a listing of such specific abiotic cells present in the OWCRNA is not given here.

Another justification for establishment of the OWCRNA involves the use of the area for research. Though no studies are known to be taking place within the area at the present time, the OWCRNA could support extensions of existing, localized research focusing on specific communities and their ecotones. Examples of such research include Austin (1987); Brotherson et al. (1984); Brotherson and Brotherson (1979); Brotherson and Brotherson (1981); Greenwood and Brotherson 1978; Moretti and Brotherson (1982); Potter et al. (1985); and Shupe and Brotherson (1985).

PRINCIPAL DISTINGUISHING FEATURES

The OWCRNA comprises several small isolated mesa tops and high ridges along the eastern edge of the Old Woman Plateau (Photos 1, 4). The easternmost mesa top contains the Convulsion benchmark (8663 ft/2640 m) on its highest point, and is crossed by the National Forest boundary so that its eastern

Table 1. Specific cells represented in the Old Woman Cove RNA, and what they add to the RNA system.

CELLS - VEGETATION TYPES	WITHIN GEOGRAPHIC SECTION:	
	FILLS NEW CELL	ADDS DESIRED REDUNDANCY
TALL FOREST COMMUNITIES		
- <i>Abies concolor/Symphoricarpos oreophilus</i> (white fir/mountain snowberry)		X
- <i>Abies concolor/Cercocarpus ledifolius</i> (white fir/curlleaf mountain mahogany)		X
SHORT FOREST, WOODLAND AND SHRUBLAND COMMUNITIES		
- <i>Artemisia nova</i> (black sagebrush)		X
- <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> (mountain big sagebrush)		X
- <i>Atriplex gardneri</i> var. <i>cuneata</i> (Castle Valley saltbush)	X	
- <i>Cercocarpus ledifolius</i> (curlleaf mountain mahogany)		X
- <i>Eriogonum corymbosum</i> (corymbbed buckwheat)	X	
- <i>Pinus edulis-Juniperus osteosperma/Cercocarpus ledifolius</i> (two-needle piñon pine-Utah juniper(curlleaf mountain mahogany)	X	
- <i>Pinus edulis-Juniperus osteosperma/Cercocarpus montanus</i> (two-needle piñon pine-Utah juniper/birchleaf mountain mahogany)	X	
HERBACEOUS COMMUNITIES		
- <i>Elymus salinus</i> (Salina wildrye)	X	
- <i>Poa fenderiana-Stipa comata-Elymus spicatus</i> (muttongrass-needle-and-thread-bluebunch wheatgrass)	X	

portion is excluded from the RNA. Falling away rapidly from these relatively level highlands are steep slopes and cliff bands that reach nearly to the floor of Castle Valley to the east (Photos 1-3). Most prominent among these latter landforms is the cliff band of the Star Point Sandstone (see Photo 1), which is located at about 7400-7800 feet (2255-2375 m) elevation throughout the area.

The entire OWCRNA is underlain by sedimentary rocks of Cretaceous age (Hintze and Stokes 1964). Several distinct layers of sandstone form cliff bands of varying thickness. Steep slopes between the cliff bands and around the lowest elevations of the area are comprised largely of shales, with some interbedded lenses of coal.

By virtue of its elevational range and dissected topography, the OWCRNA contains a rather large diversity of vegetation types for a member of the RNA system. The coolest/wettest habitats, primarily on upper-elevation north-facing slopes, support tall forests containing a mixture of conifers (white fir, Douglas-fir and ponderosa pine). In various warmer/drier habitats at upper elevations are stands of purer ponderosa pine; woodlands of curlleaf mountain mahogany and piñon-juniper; shrublands of mountain big sagebrush and black sagebrush; grasslands of muttongrass, needle-and-thread, bluebunch wheatgrass and Salina wildrye; and communities of low forbs and cushion plants. Around the lower-elevation periphery of the area, on slopes largely formed in shale materials, are salt-desert shrub communities where Castle Valley saltbush and shadscale are predominant. Lower-elevation slopes with substantial coverings of sandstone colluvium support piñon-juniper woodlands accompanied by several mountain-brush species.

All of these features are present in little-altered or pristine condition. Unlike similar areas nearby, the Old Woman Cove site contains no significant evidence of human works or livestock grazing, except for some incidental cattle presence around the lower northern margin of the area.

LOCATION

The Old Woman Cove RNA is located on the Richfield Ranger District of the Fishlake National Forest. It lies about 8 miles (13 km) southwest of Emery and 26 miles (42 km) east-southeast of Salina, in northeastern Sevier County (Maps 1-3). Latitude and longitude for the approximate center of the area are 38°52' North and 111°23' West, respectively. The least rectangle that includes the whole area is defined (to 30-seconds precision) by the following latitude/longitude lines: North - 38°53'30"N; South - 38°51'00"N; West - 111°24'30"W; East - 111°22'00"W. Specifically, the area lies in portions of sections 24, 25 and 36 of T22S R4E, and sections 19, 20, 29, 30, 31 and 32 of T22S R5E, Salt Lake Meridian (Maps 3-4). It is included on four 7.5' topographic quadrangles: Acord Lakes, Emery West, Old Woman Plateau and Walker Flat. Stereo coverage is provided by the following sets of aerial photographs, housed at the Forest Supervisor's Office:

Line 35 (western):	7-23-87	USDA-F	16 614080	287-216 through 287-220
Line 36 (eastern):	7-18-89	USDA-F	16 614080	1087-30 through 1087-34
Line 58 (western):	8-19-95	USDA-F	16 614080	995-40 through 995-44
Line 59 (eastern):	8-19-95	USDA-F	16 614080	995-70 through 995-75

The boundary of the OWCRNA (Map 4) follows a combination of natural topographic features and surveyed land lines. A description of this boundary is provided in Appendix F. The boundary shown on Map 4 encompasses an area of 2510 acres (1015 ha). Elevation ranges from about 6790 feet (2070 m) in South Water Hollow at the northern tip of the area, up to 8675 feet (2644 m) on the level mesa top in the center of the area. This represents a vertical relief of about 1885 feet (574 m).

The best access to the upper elevations of the OWCRNA is from the southwest via Forest Road #011, which leads northward from the summit on I-70 between Salina and Fremont Junction ("Emigrant Pass" on National Forest maps). This dirt road is rough in many spots and becomes very slippery in wet weather, so four-wheel-drive vehicles are recommended. One cannot access this road directly from I-70 at the summit. Instead, one should leave I-70 at Exit #85 and follow the old road that parallels the south side of I-70 approximately 4 miles (6 km) westward up to the junction of Road #011. This road goes immediately under the lanes of I-70 and then winds generally northward, crossing the drainages of Mill Hollow, Trough Hollow and Saleratus Creek. About 9.0 miles (14.4 km) along Road #011 from the I-70 underpass is the junction of a spur route, Forest Road #1415, in the SE $\frac{1}{4}$ of section 3 (T23S R4E). Follow Road #1415 northeastward and northward 1.5-2.0 miles (2.4-3.2 km) or more, depending on road

conditions and vehicle capability, and select a parking spot. (In 1997 the field crew was able to drive this road about to the point where it crosses the line between sections 35 and 2.) From the end of the road, about another 1.5 miles (2.4 km) of ridgecrest must be traversed cross-country to reach the southwestern corner of the OWCRNA. Travel along this crest, whether by foot or horse, is hindered by thick brush (chiefly curlleaf mahogany and manzanita) plus some patches of dense conifers (piñon pine, Douglas fir, white fir). Travel on the high ridgecrest within the RNA poses similar obstacles until one reaches the main level-topped mesas that adjoin the south margin of The Cove.

Access to the northern end of the OWCRNA, i.e. lower Water Hollow and the floor of The Cove, is possible via a progressively deteriorating road that leads westward along the north side of Quitchupah Creek from Utah Highway 10. Owing to the condition of the road and the clay/shale country that it traverses, four-wheel-drive vehicles are recommended for this approach. The dirt road leaves Hwy 10 approximately 8½ miles (13½ km) north of Fremont Junction (I-70 Exit #89), or 1 mile (1.6 km) north of the Sevier-Emery County line. The road is used for agricultural access and thus is in relatively good condition for about the first 3.7 miles (5.9 km) to an old homestead. Westward from this location the road is much more primitive, but it can be followed in good weather for about another 2.4 miles (3.8 km) to the junction of a spur to the south that crosses Quitchupah Creek and leads up into Water Hollow. [This point may also be reachable via Forest Road #006 eastward down Convulsion Canyon from just below the coal mine, but this route was not investigated during the RNA field inventories.] The spur road up Water Hollow can be driven, though the 1997 field crew chose to walk it to the point where it leaves the canyon bottom in the NE¼ NW¼ of section 20 (T22S R5E). Various cross-country routes can be walked to gain access to the OWCRNA in The Cove or adjacent to lower Water Hollow. Primary impediments to foot travel are steep, rocky slopes and occasional patches of thick brush. The 1997 edition of the Forest map shows a designated trail (#106) along the bottom of Water Hollow, but no evidence of an obvious trail was seen by the 1997 field crew.

Finally, lower-elevation habitats in the southeastern portion of the OWCRNA are accessible via a dirt road that leads westward from Utah Highway 10 about 4.0 miles (6.4 km) north of Fremont Junction. This is another road through clay/shale country on which four-wheel-drive vehicles are recommended. The road is in reasonably good condition for about the first 1½ miles (2½ km), to the vicinity of a homestead visible on the opposite side of a major wash. Do not cross this wash, but rather follow a primitive two-track route (not shown on the topographic map) northwestward up into the SE¼ SE¼ of section 5 (T23S R5E). From this point one can work their way on foot up the slope to the west, finding ways through the multiple cliff bands, to the crest of the ridge above which is then followed northward to the RNA boundary. Chief impediments on this access route are tedious route-finding exercises and rugged terrain near and in the RNA proper.

AREA BY COVER TYPES

The extent and distribution of vegetation cover types in the OWCRNA has been derived from field surveys and subsequent aerial photo interpretation. Several systems for classifying such types are considered, as discussed below.

The Society of American Foresters cover type classification (Eyre 1980) applies only to portions of the OWCRNA that contain coniferous forests and woodlands. The tall mixed-conifer forests (Douglas-fir, white fir and ponderosa pine) at the upper elevations belong to SAF Type 210: Interior Douglas-fir, because Type 211 (white fir) is defined by Eyre (1980; p. 92) as being confined to the west coast. The stand of mature, mostly pure ponderosa pine on the level-topped highland to the west of The Cove belongs to SAF Type 237: Interior Ponderosa Pine. Woodlands of two-needle piñon pine and Utah juniper belong to SAF Type 239: Pinyon-Juniper. Non-forest types are not considered in the SAF system.

The classification of potential natural vegetation by Küchler (1966) applies more comprehensively to the vegetation of the OWCRNA. The tall mixed-conifer forests correspond to Type 19: Spruce-Fir-Douglas fir Forest (though spruce is absent). The pure stand of mature ponderosa pine corresponds to Type 17: Pine-Douglas fir Forest (though Douglas-fir is absent). Piñon-juniper woodlands correspond to Type 21: Juniper-Pinyon Woodland. Curlleaf mountain mahogany woodlands correspond to Type 31: Mountain Mahogany-Oak Scrub (though Gambel oak is very scarce). Mountain big sagebrush and black sagebrush communities would be combined in Type 32: Great Basin Sagebrush. Castle Valley saltbush and other shrub communities on shale substrates would be combined in Type 34: Saltbush-Greasewood (though greasewood is absent). Grassland communities might correspond with Type 50: Wheatgrass-Needlegrass Shrubsteppe, though this appears to be a type of the western Great Plains (Montana and Wyoming); if so, then the grassland communities of the OWCRNA do not correspond to any Küchler type. Finally, the small areas of cushion-plant communities, rock outcrops and other sparsely vegetated areas do not correspond to any Küchler type.

Table 2 shows the estimated areas of vegetation types defined by the SAF and Küchler systems described above, and also displays the correspondence ("cross-walking") between these two broad classification schemes for forest types. The distribution of SAF cover types and Küchler types in the OWCRNA is shown on Map 5. The polygons on Map 5 are the same as those on a map of soils done for a portion of the Forest. Because of this, not every mapping unit on Map 5 represents a pure vegetation cover type. The proportional composition of vegetation cover types represented in these mapping units (via coarse ocular estimates) is provided in the map legend. Finally, small areas of the OWCRNA that are not considered by the SAF or Küchler systems (e.g. rock outcrops, cushion-plant sites) are not shown separately on Map 5, but rather are included within the larger soil/vegetation mapping units.

According to more-detailed classification work in the region by Youngblood and Mauk (1985), portions of the OWCRNA are identified as representative of two coniferous forest habitat types. Further, non-forested communities of the OWCRNA were delineated in more detail based on floristic composition observed during the field work done for this Establishment Record. Table 3 shows correspondence between the broad SAF/Küchler types and vegetation units defined in greater detail by Youngblood and Mauk (1985) and field surveys. A distribution map and estimated areas are not provided for the more detailed vegetation types, because they occur in too intricate a mosaic for realistic resolution at the mapping scale used in this Record.

Table 2. Estimated areas of SAF and Küchler types in the Old Woman Cove RNA.

COVER TYPE	TYPE NUMBER		ESTIMATED AREA	
	SAF (1980)	Küchler (1966)	Acres	Hectares
Mixed-conifer (Douglas-fir, white fir)	210	19	255	103
Ponderosa pine	237	17	80	32
Piñon-juniper	239	21	1090	441
Mountain mahogany	---	31	165	67
Sagebrush	---	32	25	10
Saltbush (Shale exposures)	---	34	500	202
Mixed grasses	---	50? (or none)	395	160
			TOTAL	2510 1015

Table 3. Correspondence between the broad SAF and KÜCHLER types and vegetation communities or habitat types defined in greater detail.

COVER TYPE	TYPE NUMBER SAF	KÜCHLER	MORE-DETAILED COMMUNITIES/HABITAT TYPES
Mixed-conifer	210	19	<i>Abies concolor/Symphoricarpos oreophilus</i> h.t. <i>Abies concolor/Cercocarpus ledifolius</i> h.t.
Ponderosa pine	237	17	<i>Pinus ponderosa/Arctostaphylos patula</i> communities
Pinyon-Juniper	239	21	<i>Pinus edulis-Juniperus osteosperma/Cercocarpus ledifolius</i> communities <i>Pinus edulis-Juniperus osteosperma/Cercocarpus montanus-Amelanchier utahensis</i> communities
Mountain mahogany	---	31	<i>Cercocarpus ledifolius/Arctostaphylos patula</i> communities <i>Cercocarpus ledifolius</i> /grass communities
Sagebrush	---	32	<i>Artemisia tridentata</i> ssp. <i>vaseyanus</i> /grass communities <i>Artemisia nova</i> /grass communities
Saltbush	---	34	<i>Atriplex gardneri</i> var. <i>cuneata</i> communities <i>Eriogonum corymbosum</i> communities
Mixed grasses	---	50?	<i>Poa fendleriana-Stipa comata-Elymus spicatus-Elymus salinus</i> communities
Not covered	---	--	Low forb - cushion plant communities

PHYSICAL AND CLIMATIC CONDITIONS

The OWCRNA encompasses the top and subtending slopes of a broad ridgecrest that represents the easternmost extension of the Old Woman Plateau (Photos 1-4). Portions of this ridgecrest are relatively flat and mesa-like, particularly in the locations that surround the southern margin of The Cove. Cliffs and steep slopes descend from the high ridge top on all sides. Substrates in the area are derived mostly from sandstone and shale parent materials.

The Old Woman Plateau is influenced by a semi-arid climatic regime. Winter months are characterized by periodic storms that approach from the northwest. These storms provide the majority of

annual precipitation on the area, mostly in the form of snow. Bitterly cold arctic air masses and long-lasting high pressure ridges are also typical of winter weather. The summer season is typified by warm temperatures and frequent convective thunderstorms. These thunderstorms produce intense local rainfall and high wind velocities.

The massive high plateaus that form a north-south spine through the central part of Utah create local rainshadows along their eastern margins. Located to the east of the Wasatch Plateau, the OWCRNA is in such a shadow. Its climatic conditions are similar to those of the Nelson Mountain RNA, which lies about 15 miles (24 km) to the northeast. Nelson Mountain receives about 15 inches (380 mm) of precipitation annually, while the highest elevations of the Wasatch Plateau receive more than 40 inches (1020 mm). Nelson Mountain averages between 100 and 120 freeze-free days per year.

The National Weather Service (NWS) and USDA Natural Resources Conservation Service (NRCS) monitor climatic data at several installations surrounding the OWCRNA. Table 4 shows the name, record length, elevation, and location relative to the OWCRNA for six NRCS snotel sites and four NWS stations in the vicinity. Tables 5-7 contain average climatic data for these sites as posted on the internet. Those who use the OWCRNA for research may want to access these internet sites directly for climatic information, rather than relying on the summaries in Tables 5-7. The internet addresses are www.utdmp.utsnow.ncrns.usda.gov for the NRCS snotel sites, and wrcc.sage.dri.edu (Western Regional Climate Center) for the NWS stations.

Table 4. Site data for climatic installations in the vicinity of the OWCRNA.

SITE NAME	RECORD LENGTH	ELEVATION	LOCATION RELATIVE TO OWCRNA
NRCS SNOTEL			
Beaver Dams	1978-Present	7900 ft/2410 m	20 miles (32 km) to NW
Buck Flat	1978-Present	9800 ft/2985 m	18 miles (29 km) to NNW
Dill's Camp	1978-Present	9200 ft/2805 m	12 miles (19 km) to NNW
Farnsworth Lake	1978-Present	9600 ft/2925 m	16 miles (26 km) to SW
Gooseberry R.S.	1978-Present	7920 ft/2415 m	16 miles (26 km) to WSW
Pickle Keg	1978-Present	9600 ft/2925 m	14 miles (22 km) to NW
NWS STATIONS			
Emery	1901-1978	6200 ft/1890 m	8 miles (13 km) to ENE
Emery 15 SW	1979-1986	7650 ft/2330 m	7 miles (11 km) to SSW
Ferron	1948-Present	5940 ft/1810 m	21 miles (34 km) to NE
Salina 24 E	1986-Present	7560 ft/2305 m	4 miles (6 km) to NNW

Table 5. Average monthly precipitation data for six SNOTEL sites in the vicinity of the OWCRNA.

SITE NAME													
OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	
BEAVER DAMS													
2.3 in 58 mm	2.4 in 61 mm	2.4 in 61 mm	2.5 in 64 mm	2.6 in 66 mm	3.6 in 91 mm	3.1 in 79 mm	2.2 in 56 mm	1.0 in 25 mm	1.1 in 28 mm	1.5 in 38 mm	1.7 in 43 mm	26.4 in 671 mm	
BUCK FLAT													
2.5 in 64 mm	3.0 in 76 mm	2.6 in 66 mm	3.2 in 81 mm	3.4 in 86 mm	3.7 in 94 mm	2.9 in 74 mm	2.6 in 66 mm	1.3 in 33 mm	1.2 in 30 mm	2.1 in 53 mm	2.2 in 56 mm	30.7 in 780 mm	
DILL'S CAMP													
2.3 in 58 mm	2.7 in 69 mm	3.7 in 94 mm	2.6 in 66 mm	2.6 in 66 mm	2.9 in 74 mm	3.0 in 76 mm	2.4 in 61 mm	2.5 in 64 mm	1.8 in 46 mm	2.8 in 71 mm	1.9 in 48 mm	31.1 in 790 mm	
FARNSWORTH LAKE													
3.0 in 76 mm	3.5 in 89 mm	2.9 in 74 mm	2.8 in 71 mm	3.5 in 89 mm	5.0 in 127 mm	4.5 in 114 mm	2.8 in 71 mm	1.7 in 43 mm	1.6 in 41 mm	2.8 in 71 mm	1.9 in 48 mm	36.0 in 914 mm	
GOOSEBERRY RANGER STATION													
2.2 in 56 mm	2.5 in 64 mm	2.0 in 51 mm	2.1 in 53 mm	2.2 in 56 mm	3.5 in 89 mm	2.9 in 74 mm	2.2 in 56 mm	1.4 in 36 mm	1.0 in 25 mm	2.0 in 51 mm	1.4 in 36 mm	25.4 in 645 mm	
PICKLE KEG													
2.0 in 51 mm	3.0 in 76 mm	3.4 in 86 mm	2.9 in 74 mm	3.1 in 79 mm	4.4 in 112 mm	4.3 in 109 mm	2.6 in 66 mm	1.5 in 38 mm	1.1 in 28 mm	2.1 in 53 mm	1.7 in 43 mm	32.1 in 815 mm	

Table 6. Average monthly precipitation data for four NWS sites in the vicinity of the OWCRNA.

SITE NAME													
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
EMERY													
0.46 in 12 mm	0.51 in 13 mm	0.42 in 11 mm	0.38 in 10 mm	0.59 in 15 mm	0.51 in 13 mm	0.81 in 21 mm	1.10 in 28 mm	0.89 in 23 mm	0.80 in 20 mm	0.33 in 8 mm	0.43 in 11 mm	7.24 in 184 mm	
EMERY 15 SW													
0.96 in 24 mm	0.78 in 20 mm	1.95 in 50 mm	1.05 in 27 mm	0.98 in 25 mm	0.73 in 19 mm	1.49 in 38 mm	1.51 in 38 mm	1.43 in 36 mm	1.24 in 31 mm	1.24 in 31 mm	1.09 in 28 mm	14.46 in 367 mm	
FERRON													
0.67 in 17 mm	0.58 in 15 mm	0.61 in 15 mm	0.47 in 12 mm	0.76 in 19 mm	0.50 in 13 mm	0.89 in 23 mm	1.10 in 28 mm	0.93 in 24 mm	0.80 in 20 mm	0.56 in 14 mm	0.52 in 13 mm	8.37 in 213 mm	
SALINA 24 E													
1.14 in 29 mm	1.10 in 28 mm	1.30 in 33 mm	1.03 in 26 mm	1.42 in 36 mm	0.66 in 17 mm	1.15 in 29 mm	1.75 in 44 mm	1.52 in 39 mm	1.11 in 28 mm	1.12 in 28 mm	0.85 in 22 mm	14.16 in 360 mm	

Table 7. Average monthly maximum and minimum temperatures, and temperature extremes, for four NWS sites in the vicinity of the OWCRNA.

	SITE NAME											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN

EMERY

36.7 F	42.2 F	49.7 F	59.3 F	68.8 F	77.6 F	83.1 F	81.4 F	74.3 F	63.5 F	49.9 F	39.3 F	60.5 F
2.6 C	5.7 C	9.8 C	15.2 C	20.4 C	25.3 C	28.4 C	27.4 C	23.5 C	17.5 C	9.9 C	4.1 C	15.8 C

11.0 F	16.1 F	22.8 F	30.0 F	37.8 F	45.4 F	52.2 F	50.7 F	42.0 F	32.3 F	21.5 F	13.6 F	31.3 F
-11.7 C	-8.8 C	-5.1 C	-1.1 C	3.2 C	7.4 C	11.2 C	10.4 C	5.6 C	0.2 C	-5.8 C	-10.2 C	-0.4 C

TEMPERATURE EXTREMES: 98 F/37 C HIGH; -20 F/-29 C LOW

EMERY 15 SW

35.9 F	36.7 F	40.8 F	49.9 F	59.9 F	72.5 F	78.4 F	76.3 F	68.8 F	53.7 F	40.7 F	35.9 F	54.2 F
2.2 C	2.6 C	4.9 C	9.9 C	15.5 C	22.5 C	25.8 C	24.6 C	20.4 C	12.1 C	4.8 C	2.2 C	12.3 C

10.4 F	10.3 F	17.0 F	23.7 F	31.5 F	39.4 F	46.2 F	45.1 F	37.5 F	26.3 F	16.5 F	10.8 F	26.3 F
-12.0 C	-12.1 C	-8.3 C	-4.6 C	-0.3 C	4.1 C	7.9 C	7.3 C	3.1 C	-3.2 C	-8.6 C	-11.8 C	-3.2 C

TEMPERATURE EXTREMES: 90 F/32 C HIGH; -21 F/-29 C LOW

FERRON

35.5 F	41.5 F	50.9 F	60.6 F	70.5 F	80.8 F	87.1 F	84.9 F	77.3 F	65.6 F	49.5 F	38.3 F	61.9 F
1.9 C	5.3 C	10.5 C	16.1 C	21.4 C	27.1 C	30.6 C	29.4 C	25.2 C	18.7 C	9.7 C	3.5 C	16.6 C

10.8 F	17.0 F	25.0 F	33.3 F	42.3 F	51.2 F	57.7 F	55.3 F	46.5 F	35.3 F	22.9 F	13.9 F	34.3 F
-11.8 C	-8.3 C	-3.9 C	0.7 C	5.7 C	10.7 C	14.3 C	12.9 C	8.1 C	1.8 C	-5.1 C	-10.1 C	1.3 C

TEMPERATURE EXTREMES: 100 F/38 C HIGH; -21 F/-29 C LOW

SALINA 24 E

31.1 F	34.6 F	42.3 F	50.3 F	60.2 F	71.5 F	77.5 F	75.8 F	67.1 F	56.0 F	39.6 F	31.0 F	53.1 F
-0.5 C	1.4 C	5.7 C	10.2 C	15.7 C	21.9 C	25.3 C	24.3 C	19.5 C	13.3 C	4.2 C	-0.6 C	11.7 C

13.9 F	17.8 F	23.7 F	29.9 F	37.3 F	45.2 F	51.3 F	51.0 F	42.8 F	33.5 F	22.3 F	14.3 F	32.0 F
-10.1 C	-7.9 C	-4.6 C	-1.2 C	2.9 C	7.3 C	10.7 C	10.6 C	6.0 C	0.8 C	-5.4 C	-9.8 C	0.0 C

TEMPERATURE EXTREMES: 92 F/33 C HIGH; -19 F/-28 C LOW

DESCRIPTION OF VALUES

Flora and Communities

Table 8 lists plant species in the OWCRNA. Scientific nomenclature follows Welsh et al. (1993), with some commonly-used synonyms included in Table 8 where appropriate. Nomenclature for trees agrees with Little (1979) with one exception: Intermountain bristlecone pine is treated as a distinct species, *Pinus longaeva*, according to Bailey (1970) and in agreement with Welsh et al. (1993) and Cronquist et al. (1972).

The OWCRNA contains no known occurrences of plants that are federally listed as endangered or threatened, nor of any plants considered sensitive by Region Four of the USDA Forest Service. In the vicinity, however, are two listed-threatened plants that have the potential to be found within the OWCRNA. An unconfirmed location of *Pediocactus winkleri* (Winkler cactus) has been reported about 2 miles (3 km) northwest of Fremont Junction; this species could possibly occur in the lower-elevation margins of the OWCRNA. Several occurrences of *Townsendia aprica* (Last Chance townsendia) are known from the Fishlake National Forest a short ways south of Fremont Junction. This species also could occur in the lower elevations of the OWCRNA, on shale habitats or in piñon-juniper communities.

Thirteen types of plant communities (defined by existing vegetation) or habitats (defined by abiotic features) were identified in the OWCRNA (see Table 8). Only the first three of these appear to be treated in a comprehensive, regional vegetation classification system. These thirteen communities and habitats are described in more detail below. In these descriptions, "upper elevation" refers to areas above the prominent cliffband of the Star Point Sandstone, which is located at about 7400-7800 feet (2255-2375 m) elevation throughout the area; "lower elevation" refers to sites below this major cliff feature. In general, the first ten of the following communities/habitats are restricted to or best represented at upper-elevation sites, while the final three are all or mostly found at lower-elevation sites.

A. Mixed conifer communities - *Abies concolor/Symphoricarpos oreophilus* (white fir/mountain snowberry) habitat type.

Within the OWCRNA these communities appear to be restricted to upper-elevation slopes with north or northeast aspects. The best example that was seen is on a broad north-facing slope in the southwestern part of the RNA, about ½-¾ mile (0.8-1.2 km) north of the area's southern boundary (Photo 4). This type may also be present on other steep, upper north-facing slopes in the central and northern parts of the area, but such locations were not traversed during the field inventories.

These communities have a moderately-dense coniferous forest overstory comprised of *Abies concolor*, *Pseudotsuga menziesii* and *Pinus ponderosa*. At least the *Abies* and *Pseudotsuga* are reproducing successfully. *Juniperus scopulorum* is also present as a shorter member of the overstory canopy.

Understories consist of discontinuous patches of low shrubs, with *Symporicarpos oreophilus* the most abundant. Other shrubs often present include *Amelanchier alnifolia*, *Prunus virginiana*, *Ribes cereum* and *Sambucus racemosa*. The herbaceous stratum is fairly depauperate, with *Stellaria jamesiana* and *Aster glaucodes* among the more abundant forbs. Other herbaceous species present include *Erysimum asperum*, *Penstemon watsonii*, *Senecio multilobatus* and *Swertia radiata*.

By virtue of their locations and species composition, these communities appear to occupy the most mesic and cool sites within the OWCRNA. They are identified as belonging to the *Abies concolor/Symporicarpos oreophilus* habitat type as described by Youngblood and Mauk (1985), a major habitat type of the white fir series on the Utah High Plateaus.

Table 8. Plant species in the Old Woman Cove Research Natural Area.

LIFE FORM <i>Scientific name¹ [Synonym, if any] (common name)</i>	Habitat/Plant community ²												
	A	B	C	D	E	F	G	H	I	J	K	L	M
TREES³													
<i>Abies concolor</i> (white fir)		X	X	X					X				
<i>Juniperus osteosperma</i> (Utah juniper)								X			X	X	
<i>Juniperus scopulorum</i> (Rocky Mountain juniper)	X	X			X								
<i>Pinus edulis</i> (two-needle piñon pine)	X				X	X	X				X	X	
* <i>Pinus longaeva</i> (Great Basin bristlecone pine)			X										
<i>Pinus ponderosa</i> (ponderosa pine)	X	X	X										
<i>Populus tremuloides</i> (quaking aspen)				X				X					
<i>Pseudotsuga menziesii</i> (Douglas-fir)	X	X				X							
SHRUBS AND SUBSHRUBS													
<i>Acer glabrum</i> (Rocky Mountain maple)						X							
<i>Amelanchier alnifolia</i> (serviceberry)	X												
<i>Amelanchier utahensis</i> (Utah serviceberry)		X										X	
<i>Arctostaphylos patula</i> (greenleaf manzanita)			X	X	X	X	X						
<i>Artemisia frigida</i> (fringed sagebrush)											X	X	
<i>Artemisia nova</i> (black sagebrush)							X	X	X		X	X	X
<i>Artemisia tridentata</i>													
ssp. <i>vaseyana</i> (mountain big sagebrush)					X	X	X						
ssp. <i>wyomingensis</i> (Wyoming big sagebrush)												X	X
<i>Atriplex confertifolia</i> (shadscale)												X	X
<i>Atriplex gardneri</i> var. <i>cuneata</i> (Castle Valley saltbush)													X
<i>Ceanothus martinii</i> (Martin's ceanothus)			X										
<i>Cercocarpus ledifolius</i> (curlleaf mountain mahogany)	X	X	X	X	X	X						X	
<i>Cercocarpus montanus</i> (birchleaf mountain mahogany)												X	
<i>Chrysothamnus depressus</i> (dwarf rabbitbrush)							X	X					X
<i>Chrysothamnus nauseosus</i> (rubber rabbitbrush)							X						
<i>Chrysothamnus viscidiflorus</i> (viscid rabbitbrush)						X	X	X	X				
<i>Ephedra viridis</i> (green ephedra)						X						X	
<i>Eriogonum corymbosum</i> (corymbed buckwheat)						X	X	X					X
<i>Gutierrezia sarothrae</i> (broom snakeweed)													X
<i>Holodiscus dumosus</i> (mountain spray)			X									X	
<i>Mahonia repens</i> [<i>Berberis repens</i>] (Oregon grape)	X	X	X		X							X	
<i>Pachistima myrsinoides</i> (mountain lover)			X										
<i>Prunus virginiana</i> (chokecherry)			X										
<i>Purshia mexicana</i> [<i>Cowania mexicana</i>] (cliffrose)													X
<i>Purshia tridentata</i> (bitterbrush)				X									
<i>Quercus gambelii</i> (Gambel oak)									X				
<i>Ribes cereum</i> (wax currant)			X										
<i>Ribes viscosissimum</i> (sticky currant)		X	X			X				X		X	
<i>Rosa woodsii</i> (Woods rose)			X										
<i>Sambucus racemosa</i> (red elderberry)			X					X					
<i>Symphoricarpos oreophilus</i> (mountain snowberry)			X										
<i>Tetradymia canescens</i> (gray horsebrush)										X	X		

Table 8 (Continued). Plant species in the Old Woman Cove Research Natural Area.

LIFE FORM Scientific name ¹ [Synonym, if any] (common name)	Habitat/Plant community ²												
	A	B	C	D	E	F	G	H	I	J	K	L	M
GRAMINOID													
* <i>Blepharoneuron tricholepis</i> (pine dropseed)								X					
<i>Bouteloua gracilis</i> (blue grama)										X	X	X	
<i>Bromus tectorum</i> (cheatgrass)									X	X			
<i>Carex rossii</i> (Ross' sedge)	X	X	X	X						X			
* <i>Elymus elymoides</i> [<i>Sitanion hystrix</i>] (squirreltail)			X	X					X				
<i>Elymus salinus</i> (Salina wildrye)			X	X					X	X	X	X	
<i>Elymus smithii</i> [<i>Agropyron smithii</i>] (western wheatgrass)					X								
<i>Elymus spicatus</i> [<i>Agropyron spicatum</i>] (bluebunch wheatgrass)	X									X	X		
<i>Festuca ovina</i> (sheep fescue)					X	X							
<i>Hilaria jamesii</i> (galleta)													X
* <i>Koeleria macrantha</i> (junegrass)											X		
<i>Poa fendleriana</i> (mutton grass)			X	X	X	X	X	X	X			X	
* <i>Poa secunda</i> (Sandberg bluegrass)	X						X	X	X			X	
<i>Stipa comata</i> (needle and thread)			X	X	X	X	X	X	X				
<i>Stipa hymenoides</i> [<i>Oryzopsis hymenoides</i>] (Indian ricegrass)	X				X	X	X	X	X			X	
<i>Stipa lettermanii</i> (Letterman needlegrass)			X	X									
FORBS AND SUCCULENTS													
* <i>Abronia nana</i> (low sand-verbena)													X
<i>Achillea millefolium</i> (milfoil yarrow)													
* <i>Agoseris glauca</i> (pale agoseris)								X					
* <i>Allium brandegeei</i> (Brandegee's onion)								X					
<i>Androsace septentrionalis</i> (northern rock jasmine)	X									X			
<i>Antennaria microphylla</i> (rosy pussytoes)			X						X	X	X		
<i>Arabis</i> spp. (rock cress)	X		X	X	X				X	X			
* <i>Arenaria fendleri</i> (Fendler's sandwort)					X								
* <i>Arenaria hookeri</i> (Hooker's sandwort)											X		
<i>Artemisia ludoviciana</i> (Louisiana wormwood)											X		
<i>Asclepias cryptoceras</i> (pallid milkweed)													X
<i>Aster engelmannii</i> (Engelmann aster)	X												
<i>Aster glaucodes</i> (blueleaf aster)			X										
<i>Astragalus coltonii</i> (Colton's milkvetch)										X	X	X	X
* <i>Astragalus convallarius</i> (lesser rushy milkvetch)											X		
<i>Astragalus kentrophyta</i> var. <i>elatus</i> (tall kentrophyta)													X
* <i>Astragalus musiniensis</i> (Ferron milkvetch)										X			
<i>Balsamorhiza sagittata</i> (arrowleaf balsamroot)											X		
<i>Calochortus nuttallii</i> (sego lily)											X		
* <i>Castilleja chromosa</i> (common paintbrush)									X	X			
<i>Castilleja linariifolia</i> (linearleaf paintbrush)					X						X		
* <i>Castilleja scabrida</i> (Eastwood's paintbrush)										X	X		
* <i>Caulanthus crassicaulis</i> (spindlestem)	X			X				X			X		
<i>Chaenactis douglasii</i> (Douglas dustymaiden)	X			X						X			
* <i>Cirsium wheeleri</i> (Wheeler's thistle)			X				X	X					

Table 8 (Continued). Plant species in the Old Woman Cove Research Natural Area.

LIFE FORM Scientific name ¹ [Synonym, if any] (common name)	Habitat/Plant community ²											
	A	B	C	D	E	F	G	H	I	J	K	L
FORBS AND SUCCULENTS (CONTINUED)												
<i>Comandra umbellata</i> (bastard toadflax)			X					X				
* <i>Crepis intermedia</i> (gray hawksbeard)									X	X	X	
* <i>Crepis occidentalis</i> (western hawksbeard)								X	X	X		
* <i>Cryptantha fulvocanescens</i> (yellow-hair cryptantha)						X				X	X	
<i>Cymopterus acaulis</i> (?) (plains spring parsley)					X			X		X		
* <i>Delphinium nuttallianum</i> (Nelson's larkspur)						X						
<i>Descurainia</i> sp. (tansymustard)												X
<i>Echinocereus triglochidiatus</i> (claretcup)					X	X		X		X	X	
* <i>Erigeron aphanactis</i> (hairy daisy)		X	X	X			X		X			
* <i>Erigeron eatonii</i> (Eaton's daisy)		X	X	X	X	X						
* <i>Erigeron pulcherrimus</i> (basin daisy)												X
<i>Eriogonum alatum</i> (winged buckwheat)								X		X		
<i>Eriogonum racemosum</i> (redroot buckwheat)							X	X	X			
<i>Erysimum asperum</i> (wallflower)	X			X	X				X			
<i>Gilia aggregata</i> (scarlet gilia)	X		X	X			X					
* <i>Haplopappus armerioides</i> (thrifty goldenweed)	X				X				X		X	
<i>Hedysarum boreale</i> (northern sweetvetch)												X
<i>Heterotheca villosa</i> (hairy goldenaster)						X	X	X				
* <i>Heuchera parvifolia</i> (littleleaf alumroot)	X								X			
<i>Hymenopappus filifolius</i> (hyaline herb)								X				X
<i>Hymenoxys acaulis</i> (stemless woollybase)					X		X	X	X			
<i>Hymenoxys richardsonii</i> (Colorado rubberweed)	X	X			X	X	X	X				X
<i>Lappula occidentalis</i> (western stickseed)		X					X					X
<i>Lepidium montanum</i> (mountain pepperplant)											X	X
<i>Leptodactylon pungens</i> (sharp slenderlobe)							X			X		
* <i>Lesquerella alpina</i> (alpine bladderpod)											X	X
<i>Linum perenne</i> (blue flax)									X			
<i>Lithospermum incisum</i> (showy stoneseed)							X					
<i>Lupinus argenteus</i> (silvery lupine)		X			X	X	X					
<i>Machaeranthera canescens</i> (hoary aster)					X		X					
<i>Machaeranthera grindelioides</i> (gumweed aster)							X	X	X			X
<i>Oenothera caespitosa</i> (tufted evening primrose)												X
<i>Oenothera pallida</i> (?) (pale evening primrose)									X			
<i>Opuntia fragilis</i> (brittle pricklypear)						X	X	X		X	X	X
<i>Opuntia polyacantha</i> (?) (central pricklypear)												X
* <i>Orobanche ludoviciana</i> (Louisiana cancerroot)										X		
* <i>Paronychia sessiliflora</i> (stalkless paronychia)										X	X	
<i>Pediocactus simpsonii</i> (Simpson's footcactus)							X		X			
<i>Penstemon eatonii</i> (Eaton's penstemon)	X	X		X	X	X						X
* <i>Penstemon pachyphyllus</i> (thickleaf penstemon)							X	X	X			
* <i>Penstemon strictus</i> (Rocky Mountain penstemon)										X	X	
* <i>Penstemon watsonii</i> (Watson's penstemon)	X				X				X			
<i>Petradoria pumila</i> (rock goldenrod)					X	X			X		X	

Table 8 (Continued). Plant species in the Old Woman Cove Research Natural Area.

LIFE FORM Scientific name ¹ [Synonym, if any] (common name)	Habitat/Plant community ²											
	A	B	C	D	E	F	G	H	I	J	K	L
FORBS AND SUCCULENTS (CONTINUED)												
* <i>Phacelia sericea</i> (silky phacelia)							X					
<i>Phacelia crenulata</i> (?) (crenulate phacelia)												X
* <i>Phlox hoodii</i> (carpet phlox)									X	X	X	X X
<i>Physaria</i> sp. (twinpod)								X		X	X	X
* <i>Schoencrambe linifolia</i> (slenderleaf schoencrambe)	X			X	X			X		X	X X	
<i>Sclerocactus whipplei</i> var. <i>roseus</i> (Whipple fishhook cactus)												X
* <i>Senecio integerrimus</i> (gauge plant)							X					
<i>Senecio multilobatus</i> (Uinta groundsel)	X	X		X	X	X	X			X	X	
<i>Senecio spartioides</i> (broom groundsel)							X					
<i>Stanleya viridiflora</i> (?) (desert plume)							X		X	X	X	X
<i>Stellaria jamesiana</i> (James chickweed)	X											
<i>Stephanomeria</i> sp. (wirelettuce)					X							
<i>Swertia radiata</i> [<i>Frasera speciosa</i>] (elkweed)	X											
<i>Taraxacum officinale</i> (dandelion)	X					X			X			
<i>Tragopogon dubius</i> (salsify)										X		
<i>Wyethia scabra</i> (rough mulesears)												X
<i>Yucca angustissima</i> (?) (narrowleaf yucca)												X

NOTES:

1. Scientific nomenclature follows: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins, eds. 1993. A Utah flora, second edition. Brigham Young University, Provo, UT. 986 p.
2. Habitats/Plant communities:
 - Mixed conifer communities (*Abies concolor/Symphoricarpos oreophilus* habitat type).
 - Mixed conifer communities (*Abies concolor/Cercocarpus ledifolius* habitat type).
 - Pinus ponderosa* communities.
 - Cercocarpus ledifolius/Arctostaphylos patula* communities.
 - Cercocarpus ledifolius*/grass communities.
 - Pinus edulis-Juniperus osteosperma/Cercocarpus ledifolius* communities.
 - Artemisia tridentata* ssp. *vaseyana*/grass communities.
 - Artemisia nova*/grass communities.
 - Poa fendleriana-Stipa comata-Elymus spicatus-Elymus salinus* grass communities.
 - Low forb-cushion plant communities.
 - Pinus edulis-Juniperus osteosperma/Cercocarpus montanus-Amelanchier utahensis* communities.
 - Artemisia nova-Atriplex confertifolia* communities.
 - Shale exposures.
3. With one exception as noted in text, nomenclature for trees follows: Little, E.L., Jr. 1979. Checklist of United States trees. USDA Forest Service Agricultural Handbook 541. 375 p.

* Collected and deposited in regional herbaria.

B. Mixed conifer communities - *Abies concolor/Cercocarpus ledifolius* (white fir/curlleaf mountain mahogany) habitat type.

As with the previous type, these communities occur at upper elevations of the OWCRNA. They were seen both on level mesa-top positions and on slopes with northwest through northeast aspects.

Abies concolor, *Pseudotsuga menziesii* and *Pinus ponderosa* are the most common conifers in these communities, with the first two (and occasionally also the pine) reproducing successfully (Photo 5). Other trees that may be present include *Juniperus scopulorum*, *Pinus edulis* and, near the eastern edge of the area, *Pinus longaeva*. Mature conifers are sparse in some stands of this type, in which the tall shrubs of the "understory" overtop the conifer regeneration.

Understory vegetation ranges from sparse patches to dense concentrations of tall shrubs, with *Cercocarpus ledifolius* and *Amelanchier utahensis* being abundant on most sites. A discontinuous lower shrub stratum of *Arctostaphylos patula* is present in some of these communities. Common graminoids include *Elymus salinus*, *Poa fendleriana*, *Elymus spicatus*, *Elymus elymoides* and *Carex rossii*. Some of the forbs seen in these communities are *Heterotheca villosa*, *Hymenoxys richardsonii*, *Penstemon eatonii*, *Schoencrambe linifolia* and *Senecio multilobatus*.

These communities appear to belong to the *Abies concolor/Cercocarpus ledifolius* habitat type, as described by Youngblood and Mauk (1985). Overall this is a minor habitat type of the white fir series, found sporadically on lower elevations of the Utah High Plateaus.

C. *Pinus ponderosa* (ponderosa pine) communities.

Communities of this type are restricted to the level-topped mesa or highland to the west of The Cove, near the geographic center of the OWCRNA. Specifically they occur to the west and northwest of the large open area on this nearly-level top.

Pinus ponderosa is the dominant overstory tree in these communities, with many large, old individuals (Photo 6). A few mature trees of *Abies concolor* are present, but are so widely scattered so as not to alter the appearance of these open ponderosa pine forests. A few scrubby *Populus tremuloides* trees are also present, but again with little effect on the structure and appearance of the pine forest. The understory contains regeneration of both the pine and white fir, with the latter being more widespread and abundant.

Arctostaphylos patula and *Cercocarpus ledifolius* are the principal understory species. The former is generally more abundant, and imparts a clumpy low-shrubby appearance to the floor of the pine forest. The *Cercocarpus* is generally quite scattered, and was not seen to form large dense patches as it does in the absence of a forest overstory elsewhere in the OWCRNA. Other shrubs present are *Ceanothus martinii*, *Chrysothamnus nauseosus* and *Mahonia repens*. Herbaceous species seen in these communities include the grasses *Elymus salinus*, *Elymus elymoides*, *Poa fendleriana* and *Stipa comata*, along with a fairly sparse complement of forbs.

Overall, these communities appear to represent the *Abies concolor/Cercocarpus ledifolius* habitat type described by Youngblood and Mauk (1985). The series designation (*Abies concolor*) is based on the fairly widespread presence of white fir regeneration in these stands, even though this species is not a significant overstory component. *Cercocarpus ledifolius* would likely be the understory indicator because it appears to have the necessary 5% cover throughout these stands, according to the habitat type key. However, its cover is not much greater than this (arbitrary?) 5% figure. A case could thus be made for identifying these sites as the *Abies concolor/Arctostaphylos patula* habitat type, given that the *Arctostaphylos* is the most abundant understory component.

D. *Cercocarpus ledifolius/Arctostaphylos patula* (curlleaf mountain mahogany/greenleaf manzanita) communities.

These communities are a minor constituent of the OWCRNA. The best example that was seen is on the eastern tip of the level-topped highland about 0.6 mile (1.0 km) northeast of the area's southwestern corner. This community is actually more extensive to the west of this location, but most of it had to be excluded from the RNA because of a past prescribed burn that was reseeded with exotic grasses. Other fragmentary examples of this type were seen on the southern end of the level-topped highland to the west of The Cove.

An open stand of tall *Cercocarpus ledifolius* overtops a much more dense low-shrub layer of *Arctostaphylos patula* (Photo 7). A few scattered *Juniperus scopulorum* trees are also present. Small clearings in between the shrub patches support graminoids and forbs such as *Poa fendleriana*, *Stipa comata*, *Carex rossii*, *Erigeron aphanactis*, *Erysimum asperum*, *Gilia aggregata*, *Heterotheca villosa*, *Hymenoxys richardsonii* and *Senecio multilobatus*.

E. *Cercocarpus ledifolius* (curlleaf mountain mahogany)/grass communities.

These communities form small patches to somewhat larger stands mainly on the highlands in the central and east-central parts of the OWCRNA. Well-developed examples were seen north of the large open area on the level-topped highland to the west of The Cove, and on the high ridge along the southern margin of The Cove.

Overstories consist of relatively dense stands of *Cercocarpus ledifolius* (Photo 8), in which some *Pinus edulis* trees may be scattered. A few individuals of *Abies concolor* were seen on some sites, but overall these are scarce and do not appear to represent the potential for development of coniferous forests; no other conifers were seen in these communities. Shorter shrubs present beneath the mountain mahogany canopy include *Chrysothamnus viscidiflorus*, *Ribes cereum* and *Sambucus racemosa*. Small amounts of *Arctostaphylos patula* are also present, mostly on shallower-soil microsites, but not with the continuous/dense cover as in the *Cercocarpus ledifolius/Arctostaphylos patula* communities described above (letter D).

Understories are noticeably grassy, in some places very densely so. The most abundant grasses are *Poa fendleriana*, *Elymus salinus* and *Stipa comata*. Each of these three may be individually dominant in certain areas, while on other sites they may be nearly equally abundant. *Stipa hymenoides* and *Stipa lettermanii* are associated grasses with generally lesser abundance. Common forbs seen in these communities include *Agoseris glauca*, *Allium brandegei*, *Erigeron eatonii*, *Opuntia fragilis*, *Petradoria pumila*, *Schoencrambe linifolia*, *Senecio integerrimus* and *Senecio multilobatus*.

F. *Pinus edulis*-*Juniperus osteosperma/Cercocarpus ledifolius* (two-needle piñon pine-Utah juniper(curlleaf mountain mahogany) communities.

These communities are extensive on slopes of various aspects immediately above the Star Point Sandstone in the southern quarter of the OWCRNA. They also occupy south- and west-facing slopes at upper elevations farther north in the area.

Pinus edulis and *Juniperus osteosperma* form an open to moderately dense woodland overstory (Photo 9). *Cercocarpus ledifolius* is also often present in these communities, having the same stature as the piñon and juniper trees but less abundance. Other shorter shrubs that may be present include *Ephedra viridis*, *Chrysothamnus viscidiflorus* and *Eriogonum corymbosum*.

Understories may contain appreciable amounts of grass, with *Elymus salinus* usually the most abundant species. Other grasses present include *Poa fendleriana*, *Stipa hymenoides* and *Stipa comata*. Among the more common forbs seen to be present in these communities are *Erigeron eatonii*, *Schoencrambe linifolia*, *Haplopappus armerioides*, *Petradoria pumila* and *Arabis* spp.

G. *Artemisia tridentata* ssp. *vaseyana* (mountain big sagebrush)/grass communities.

These communities are a very minor constituent of the OWCRNA. Only three small examples were seen during the field inventories, the best-developed of which is in a clearing near the northern tip of the level-topped highland to the west of The Cove. The others are in shallow swales on other parts of this same highland.

Artemisia tridentata ssp. *vaseyana* and *Chrysothamnus viscidiflorus* co-dominate a medium-height shrub stratum (Photo 10). Understories contain an abundance of grasses, with *Stipa comata*, *Poa fendleriana* and *Elymus salinus* most common. *Lupinus argenteus*, *Senecio multilobatus*, *Hymenoxys richardsonii* and *Erigeron eatonii* are among the more common forbs in these communities.

H. *Artemisia nova* (black sagebrush)/grass communities.

These communities are a minor constituent overall within the OWCRNA. They do, however, cover most of the large open area on the south-central portion of the level-topped highland to the west of The Cove, where they occupy rocky shallow-soil sites on level or convex topographic positions. Most of the surface rocks in this particular area are basaltic, representing a feature of geologic interest because the source for such rocks is many miles away.

Artemisia nova forms a diffuse to moderately dense low-shrub layer (Photo 11), accompanied by *Chrysothamnus depressus*, *Tetradymia canescens* and *Eriogonum corymbosum*. These shrubs are largely overtapped and in many places hidden by the presence of several grasses, among which *Poa fendleriana* and *Elymus salinus* are the most abundant; other grasses present include *Stipa comata*, *Elymus spicatus* and *Stipa hymenoides*. Forbs present include *Astragalus coltonii*, *Castilleja chromosa*, *Erigeron aphanactis*, *Erigeron eatonii*, *Eriogonum racemosum*, *Hymenoxys acaulis*, *Hymenoxys richardsonii*, *Lupinus argenteus*, *Machaeranthera grindeliioides*, and *Penstemon pachyphyllus*. Also notable is the presence of *Astragalus musiniensis*, a plant with a relatively narrow distribution in south-central Utah.

I. *Poa fendleriana-Stipa comata-Elymus spicatus-Elymus salinus* (muttongrass-needle-and-thread-bluebunch wheatgrass-Salina wildrye) grass communities.

These communities are individually small but are scattered through much of the upper-elevation portions of the OWCRNA. They occur on the sides and bottoms of small swales, and also on moderate to steep slopes, typically where soils tend to be deeper than the *Artemisia nova*/grass communities described immediately above (letter H).

Widely scattered individuals and patches of low shrubs such as *Eriogonum corymbosum*, *Tetradymia canescens*, *Artemisia frigida* and *Chrysothamnus viscidiflorus* may be present. However, these do not contribute significantly to the physiognomy of these communities, which are predominantly grassy in appearance (Photo 12). Each of the four grass species used in the community type name -- *Poa fendleriana*, *Stipa comata*, *Elymus spicatus* and *Elymus salinus* -- were seen to be very abundant in examples of this type within the area. Other common graminoids present include *Poa secunda*, *Stipa hymenoides* and *Carex rossii*.

These communities also contain a fairly rich complement of forbs. Among many seen in examples of this type are *Arenaria fendleri*, *Astragalus coltonii*, *Castilleja linariifolia*, *Castilleja scabrida*, *Chaenactis douglasii*, *Crepis intermedia*, *Crepis occidentalis*, *Erigeron eatonii*, *Eriogonum racemosum*, *Hymenoxys richardsonii*, *Machaeranthera canescens*, *Machaeranthera grindelioides*, *Pediocactus simpsonii*, *Penstemon pachyphyllus*, *Penstemon strictus*, *Petradoria pumila* and *Schoencrambe linifolia*.

J. Low forb-cushion plant communities.

These communities occur at widely scattered locations mostly in the upper elevations of the OWCRNA. They occupy rocky, shallow-soil sites that appear to be relatively harsh environments -- locations such as exposed convex ridge crests and shoulders, windswept saddles, etc. (Photo 13). Ground surfaces typically have a pavement of gravel or rock with little mineral soil showing.

Low-growing caespitose or cushion forbs such as *Arenaria hookeri*, *Paronychia sessiliflora* and *Haplopappus armerioides* are characteristic of these communities, and are seldom found elsewhere in the area. Other common species of these sites include *Artemisia frigida*, *Castilleja scabrida*, *Hymenoxys acaulis*, *Hymenoxys richardsonii*, *Machaeranthera grindelioides* and *Elymus salinus*.

K. *Pinus edulis*-*Juniperus osteosperma*/*Cercocarpus montanus*-*Amelanchier utahensis* (two-needle piñon pine-Utah juniper/birchleaf mountain mahogany-Utah serviceberry) communities.

These communities are fairly extensive on lower-elevation slopes beneath the Star Point Sandstone in the southern, eastern and northern portions of the OWCRNA. They are mostly different from the *Pinus-Juniperus/Cercocarpus ledifolius* communities (letter F) that occur above the Star Point Sandstone, particularly in terms of associated shrub species, but such differences are not distinct everywhere in the area. These lower-elevation piñon-juniper communities occupy slopes on which a veneer of sandstone rubble or colluvium from the cliffs above covers the underlying shale material. These slopes are relatively rough terrain, being dissected into a series of alternating gullies and spur ridges.

Pinus edulis and *Juniperus osteosperma* form an open to moderately dense woodland overstory. Stands traversed during the field inventories were largely uneven-aged, with some old piñon trees up to 20 inches (51 cm) in diameter and 20 feet (6 m) tall. Slightly shorter than the piñon and juniper trees is a discontinuous layer of *Cercocarpus montanus* and *Amelanchier utahensis* shrubs (Photo 14). *Purhsia mexicana* is another medium-height shrub present in lesser amounts. *Artemisia nova* is by far the most abundant among low-shrub species present in these communities, with *Atriplex confertifolia* and *Chrysothamnus* spp. less common.

Herbaceous understory vegetation is relatively sparse, especially where the trees and taller shrubs are most dense. Common grasses and forbs include *Elymus salinus*, *Poa fendleriana*, *Stipa hymenoides*, *Astragalus coltonii*, *Caulanthus crassicaulis*, *Hedysarum boreale*, *Lepidium montanum*, *Penstemon eatonii*, *Petradoria pumila*, *Phlox hoodii* and *Senecio multilobatus*.

L. *Artemisia nova*-*Atriplex confertifolia* (black sagebrush-shadscale) communities.

These communities are a very minor component of the OWCRNA, being confined to a few locations on alluvial benches adjacent to lower Water Hollow and in the bottom of The Cove, at the lowest elevations of the area. They are substantially different from the *Artemisia nova*/grass communities on the level-topped highland west of The Cove. Being located at the margins of the RNA, these lower-elevation *Artemisia-Atriplex* communities are the most vulnerable to incursions of outside influences. They are thus not considered as an important feature of the area.

Artemisia nova and *Atriplex confertifolia* are the two most abundant shrubs (Photo 15), with *Artemisia tridentata* ssp. *wyomingensis* and *Gutierrezia sarothrae* occasionally also present. Based on the few examples seen during field inventories, common grasses and forbs of these communities include *Elymus salinus*, *Poa secunda*, *Opuntia fragilis*, *Phlox hoodii* and *Schoenoprambe linifolia*.

M. Shale exposures.

These habitats are scattered on lower-elevation slopes beneath the Star Point Sandstone throughout the northern, eastern and southern portions of the OWCRNA. The slopes themselves are formed in the Masuk Shale, though they are extensively covered by colluvial sandstone debris from the overlying Star Point cliffs. The shale habitats described here are portions of the Masuk stratum with little or no colluvial veneer. Two expressions of the shale appear to be present: (1) gray-colored, probably purer shale, with vegetation cover typically very sparse; and (2) brown-colored shale, perhaps with more sand intermixed, that generally supports a more diverse mix of species with somewhat greater (though still fairly sparse) cover.

Exposures of the gray shale mostly support widely scattered clumps of *Atriplex gardneri* var. *cuneata* and, to a lesser extent, *Eriogonum corymbosum* (Photo 16). A few grasses and forbs accompany these sparse shrubs.

Exposures of the browner shale support a relatively greater abundance of *Eriogonum corymbosum*, along with *Atriplex gardneri* var. *cuneata* and *Atriplex confertifolia* (Photo 17). Two grass species present in many examples of these habitats are *Hilaria jamesii* and *Elymus salinus*. A fairly rich mix of forbs occurs on these habitats, including *Abronia nana*, *Asclepias cryptoceras*, *Astragalus coltonii*, *Castilleja scabrida*, *Cryptantha fulvocanescens*, *Erigeron pulcherrimus*, *Haplopappus armerioides*, *Hymenopappus filifolius*, *Hymenoxys richardsonii*, *Lepidium montanum*, *Lesquerella alpina*, *Machaeranthera grindeloides* and *Phlox hoodii*.

Fauna

Table 9 lists animal species that are known or likely to occur in the OWCRNA. It is a fairly general list compiled by the Richfield Ranger District Wildlife Biologist, based on knowledge of the area. It is not intended to be a complete, exhaustive listing of all animal species present in the OWCRNA.

The OWCRNA contains known or likely occurrences of several special-status animal species. Wintering bald eagles (federally threatened) may occasionally use habitats within the area, particularly along its eastern margin. Three species considered Sensitive by Region Four of the USDA Forest Service may also be present: spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendi*), and flammulated owl (*Otus flammmeolus*). Also, the OWCRNA supports several species identified as Management Indicator Species (MIS) in the Forest Plan (USDA Forest Service 1986b; page II-29). These include several cavity nesters, which are ecological indicator MIS, plus elk and mule deer, which are high-interest MIS. The OWCRNA provides good winter range for both elk and mule deer. Abundant signs of elk were seen throughout the OWCRNA during the 1997 RNA field inventories, and signs of deer presence were frequent at the area's lower elevations.

Geology

The eastern margin of the Old Woman Plateau is a spectacular escarpment of steep slopes and cliff bands formed from sedimentary rock strata with differing resistances to erosion (Photos 1-3). The geologic formations of this area, all of Cretaceous age, are mapped by Hintze and Stokes (1964) and are described in the following paragraphs.

Table 9. Animal species known or likely to occur in the Old Woman Cove Research Natural Area.

LIFE FORM

Scientific name	Common name
BIRDS	
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Accipiter cooperi</i>	Cooper's hawk
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo swainsoni</i>	Swainson's hawk
<i>Aquila chrysaetos</i>	Golden eagle
<i>Haliaeetus leucocephalus</i>	American bald eagle
<i>Falco sparverius</i>	American kestrel
<i>Flaco mexicanus</i>	Prairie falcon
<i>Bonasa umbellus</i>	Ruffed grouse
<i>Dendragapus obscurus</i>	Blue grouse
<i>Zenaida macroura</i>	Mourning dove
<i>Bubo virginianus</i>	Great horned owl
<i>Otus flammeolus</i>	Flammulated owl
<i>Chordeiles minor</i>	Common nighthawk
<i>Archilochus alexandri</i>	Black-chinned hummingbird
<i>Selasphorus platycercus</i>	Broad-tailed hummingbird
<i>Selasphorus rufus</i>	Rufous hummingbird
<i>Colaptes auratus</i>	Northern flicker
<i>Picoides villosus</i>	Hairy woodpecker
<i>Contopus sordidulus</i>	Western wood peewee
<i>Tachycineta bicolor</i>	Tree swallow
<i>Cyanocitta stelleri</i>	Steller's jay
<i>Nucifraga columbiana</i>	Clark's nutcracker
<i>Corvus corax</i>	Common raven
<i>Parus atricapillus</i>	Black-capped chickadee
<i>Parus gambeli</i>	Mountain chickadee
<i>Sitta carolinensis</i>	White-breasted nuthatch
<i>Troglodytes aedon</i>	House wren
<i>Salpinctes obsoletus</i>	Rock wren
<i>Catharus guttatus</i>	Hermit thrush
<i>Sialia currucoides</i>	Mountain bluebird
<i>Sialia mexicana</i>	Western bluebird
<i>Turdus migratorius</i>	American robin
<i>Dendroica coronata</i>	Yellow-rumped warbler
<i>Junco hyemalis</i>	Dark-eyed junco
<i>Pooecetes gramineus</i>	Vesper sparrow
<i>Spizella breweri</i>	Brewer's sparrow
<i>Carduelis pinus</i>	Pine siskin
<i>Carpodacus cassini</i>	Cassin's finch
REPTILES	
<i>Sceloporus occidentalis</i>	Western fence lizard
<i>Phrynosoma platyrhinos</i>	Desert horned lizard

Table 9. Animal species known or likely to occur in the Old Woman Cove Research Natural Area.

LIFE FORM	Scientific name	Common name
MAMMALS		
	<i>Cervus elaphus</i>	Elk (Wapiti)
	<i>Odocoileus hemionus</i>	Mule deer
	<i>Euderma maculatum</i>	Spotted bat
	<i>Corynorhinus townsendi</i>	Townsend's big-eared bat
	<i>Eptesicus fuscus</i>	Big brown bat
	<i>Myotis californicus</i>	California myotis
	<i>Tadarida brasiliensis</i>	Mexican freetail bat
	<i>Ursus americanus</i>	Black bear
	<i>Mustela frenata</i>	Long-tailed weasel
	<i>Taxidea taxus</i>	Badger
	<i>Canis latrans</i>	Coyote
	<i>Felis concolor</i>	Mountain lion
	<i>Lynx rufus</i>	Bobcat
	<i>Tamias umbrinus</i>	Uinta chipmunk
	<i>Marmota flaviventris</i>	Yellow-bellied marmot
	<i>Spermophilus lateralis</i>	Golden-mantled ground squirrel
	<i>Tamiasciurus hudsonicus</i>	Red squirrel
	<i>Dipodomys ordii</i>	Ord kangaroo rat
	<i>Perognathus parvus</i>	Great Basin pocket mouse
	<i>Peromyscus maniculatus</i>	Deer mouse
	<i>Zapus princeps</i>	Western jumping mouse
	<i>Erethizon dorsatum</i>	Porcupine
	<i>Lepus americanus</i>	Snowshoe hare
	<i>Lepus californicus</i>	Black-tailed jackrabbit
	<i>Sylvilagus nuttallii</i>	Mountain cottontail

The uppermost stratum widely exposed in the OWCRNA is the Castle Gate Sandstone. It forms the thin "cap" on the relatively level highlands that adjoin the southwestern through southeastern margins of The Cove. It is also present on the small "finger" of level mesa top in the southwestern corner of the OWCRNA. The Castle Gate is a massive, cliff-forming gray sandstone, coarse-grained to conglomeratic. On the surfaces of these highlands there may be outcrops of the overlying Price River Formation, comprised of sandstone, conglomerate and shale, but these would be small remnants.

On the main highland southwest of The Cove, near the center of the OWCRNA, the ground surface is occupied by cobbles and small boulders of basaltic composition. These are interesting in that the nearest source for such rocks is a considerable distance to the south or southwest; for example, materials of this type mantle the surface near the Fremont Junction interchange on I-70. Such basaltic rocks were not noticed (though not specifically looked for) along the vehicle route that accesses the southwestern portion of the OWCRNA from the summit on I-70.

Underlying the Castle Gate Sandstone, and separated from it by an unconformity, is the Black Hawk Formation, comprised of alternating layers of buff and gray sandstone, gray shale and coal. Major coal seams near the base of the Black Hawk Formation are the primary source of coal produced by mines on the east side of the Wasatch Plateau. Below the Black Hawk Formation is the Star Point Sandstone, primarily a massive, cliff-forming buff sandstone that also contains some interbedded shales. The Star Point Sandstone forms the prominent high cliff line that is nearly continuous in the vicinity of the OWCRNA (see Photo 1), and that effectively separates the site into upper- and lower-elevation portions.

The lowermost stratum exposed in the OWCRNA, forming the slopes at the base of the Plateau's eastern escarpment and merging down into Castle Valley, is the Masuk Member of the Mancos Shale (Photos 1-3, 16-17). It is composed of uniform, massive gray (to tan) marine shales that are sparsely-vegetated and dissected by erosion. In many locations the Masuk Shale is covered by colluvial debris calved off from the Star Point Sandstone cliffs above. The Black Hawk, Star Point and Masuk strata exhibit an intertonguing relationship stemming from complexities of the coastal environments in which they were deposited (Flores et al. 1984, Flores et al. 1982, Ryer 1983).

Landtypes and Soils

Tew et al. (1988) identify the area of the OWCRNA and adjacent terrain to the north and south as Landtype Association M3112-B2K, Steep Canyons and Scarp Faces. They describe the landscape as being dominated by east-facing scarp slopes with abundant rock outcrops. Sandstone and shale parent materials are common, slopes exceed 40 percent, and elevations range from 6800 to 8600 feet (2075 to 2620 m.).

Soils have been identified and mapped for the Salina Canyon area of the Forest. The map of vegetation cover types in the OWCRNA (Map 5) is actually a soils map of the area, as mentioned previously in the **AREA BY COVER TYPES** section of this Establishment Record. The soils that comprise the map units depicted on Map 5 are listed in Table 10.

Lands

The Old Woman Cove RNA is entirely reserved National Forest system land with no encumbrances or withdrawals.

Cultural

Little archeological inventory work has been done in the area of the OWCRNA. Evidence indicates that Archaic cultures occupied the area from about 6000 B.C. to A.D. 450. These people were primarily hunter-gatherers who did not raise crops. Subsequent to this, the Fremont people occupied sites now on National Forest land, mostly in the lower elevation canyon bottoms. A few sites have been reported in the general vicinity that appear to be of even later Ute origin. Finally, the OWCRNA was seen to contain no structures or cultural artifacts of more recent, post-European-settlement times, though a thorough survey might reveal the remains of transient livestock camps.

Other

The Old Woman Cove RNA contains no other known features of local (or wider) importance.

Table 10. Soils of the Old Woman Cove Research Natural Area (Refer to Map 5).

Map Unit Symbol	Soil Taxa In Unit	% Composition	% Slope
3A	Rock Outcrop and Torriorthents	---	15-80
21	Lithic Ustic Torriorthents, loamy-skeletal, mixed (calc), frigid	40	25-60
	Ustic Torriorthents, loamy, mixed (calc), frigid	20	
	Rock Outcrop	20	
21A	Lithic Ustic Torriorthents, loamy-skeletal, mixed (calc), frigid	50	15-60
	Ustic Torriorthents, fine-loamy, mixed (calc), frigid	30	
	Rock Outcrop	10	
60	Typic Argiborolls, fine-loamy, mixed	65	10-40
	Pachic Argiborolls, fine-loamy, mixed	25	
70	Lithic Ustorthents, loamy-skeletal, mixed (calc), frigid	40	15-60+
	Typic Argiborolls, fine-loamy, mixed	20	
	Rock Outcrop	20	
73	Typic Cryoboralfs, loamy-skeletal, mixed	50	25-60
	Typic Cryochrepts, sandy-skeletal, mixed	25	
	Mollie Cryoboralfs, loamy-skeletal, mixed	15	
74	Borollic Haplargids, fine-loamy, mixed	50	15-60
	Mollie Eutroboralfs, fine-loamy, mixed	25	
	Borollic Lithic Haplargids, loamy, mixed	15	
75	Typic Haploborolls, loamy-skeletal, mixed	50	3-25
	Borollic Camborthids, loamy-skeletal, mixed	25	
	Typic Haploborolls, coarse-loamy, mixed	15	
76	Typic Haploborolls, loamy-skeletal, mixed	50	15-60
	Lithic Haploborolls, loamy-skeletal, mixed	30	
77	Typic Cryoboralfs, loamy-skeletal, mixed	65	8-25
	Mollie Cryoboralfs, loamy-skeletal, mixed	25	
78	Typic Ustorthents and Rubble Lands	---	25-60+
83	Aridic Haploborolls, loamy-skeletal, mixed (MD/D)	50	15-40
	Aridic Argiborolls, loamy-skeletal, mixed (MD/D)	25	
	Lithic Argiborolls, loamy, mixed	15	

IMPACTS AND POSSIBLE CONFLICTS

Mineral Resources

Three types of leasable mineral resources that are known or potentially could occur beneath the OWCRNA are (1) coal, (2) oil and gas, and (3) geothermal.

The east flank of the Wasatch Plateau, including the Old Woman Plateau, is a major coal-producing area in Utah. Large and extensive coal reserves underlie the region, especially near the base of the Cretaceous-age Black Hawk Formation (which is present in the OWCRNA). Flores et al. (1984), Flores et al. (1982) and Ryer (1983) describe the intertonguing relationships and complexities of the coastal environments in which the coal-bearing strata were deposited.

Potentially mineable coal-bearing lands for the portion of the Fishlake National Forest that includes the OWCRNA are displayed on a map on page O-8 of the Forest Plan (USDA Forest Service 1986b). That map shows that about 60% of the OWCRNA is in reserve area 83, and 15% is in reserve area 81. These are both potential reserves of the Wasatch Plateau coal fields, and are within known recoverable coal resource areas. The remaining 25% of the OWCRNA has no potential coal reserves mapped; these are primarily lower-elevation lands in the southeastern and northeastern portions of the area.

Pages O-6 and O-7 of the Forest Plan list estimated quantities of coal reserves in areas 81 and 83 (among others). Much of the reserve information for areas 81 and 83 is based on surface measurements, which are not as reliable as information derived from surface drilling. It is likely that reserve areas 81 and 83 within the OWCRNA would be in Class IV, which are **potential reserves** based on geographic and geologic position with little surrounding data.

Information on the presence and status of coal leases in this region is maintained by the Bureau of Land Management (BLM). Coal-leasing plats for T22S R4E (dated 3/3/88) and for T22S R5E (dated 11/21/95) show no coal leases present within the boundary or in the near vicinity of the OWCRNA. There have not been any expressions of interest for leasing coal within the OWCRNA for at least the past 25 years, if ever.

An existing coal mine in Convulsion Canyon is located about 2½ miles (4 km) northwest of the northern tip of the OWCRNA. Most future operations for this mine are likely to extend to its north and west, rather than in the direction of the OWCRNA (which is separated from the mine by Convulsion Canyon proper, from which the coal beds have been eroded away).

If coal resources underlying the OWCRNA are ever considered for mining in the future, then it is conceivable that a portal could be proposed for placement within the RNA. In such a case, attempts would need to be made to locate a portal outside the RNA boundary; one could be located to the east of the National Forest boundary, or to the west of the RNA. The most likely effect from subsurface coal mining that might occur, however, would be that of surface subsidence. Experience with subsidence that is occurring over the Convulsion Canyon mine shows that there would be little significant effect on vegetation communities or other surface resources.

A report on oil, gas and geothermal resources for the Fishlake National Forest (USDA Forest Service 1991) states that the entire area north of I-70, and most of the Forest, is classified as moderate potential for oil and gas. Also, this general area has moderate potential for geothermal resources.

Information on the presence and status of oil and gas leases in this region is also maintained by the BLM. Oil and gas leasing plats for T22S R4E (dated 2/28/96) and for T22S R5E (dated 6/14/96) show no oil and gas leases present within the boundary or in the near vicinity of the OWCRNA. No geothermal-

leasing plats were seen to exist for these two Townships, so it is assumed that no geothermal leases exist in or anywhere near the OWCRNA.

Another category of mineral resources is locatable minerals, which are the subject of mining claims. BLM geographic index microfiche dated 8/18/98 show no claims, neither active nor inactive, in the entire areas of T22S R4E and T22S R5E. The geologic setting of the OWCRNA is one that appears not to be favorable for the presence of locatable minerals. Thus the likelihood of impacts or possible conflicts from development of these types of mineral resources is very low or non-existent in the OWCRNA.

Grazing

The OWCRNA lies within the boundary of the South Water Hollow cattle allotment. Permitted use on the entire allotment is 292 cow-calf pairs from June 6 to October 5, for a total of 1188 head-months and 1568 AUMs. The allotment is grazed under a rest-rotation system in which on/off points and cattle movement patterns are located well away from the OWCRNA. The RNA lies in a part of the allotment that is not purposely grazed or used for trailing, because of steep, rugged terrain and lack of water. Even in the late 1800s and early 1900s the area probably received only small amounts of grazing by sheep and cattle, due to access and water constraints.

The OWCRNA receives incidental cattle grazing use only on very rare occasions. The majority of such use most likely occurs in the bottom of South Water Hollow along the northwestern margin of the RNA (based on cattle wandering down from higher in the drainage), and in lower Water Hollow and the floor of The Cove (based on cattle wandering in from adjacent BLM lands). Cattle almost never wander into the upper-elevation core of the OWCRNA, again because there is no available water there.

The Forest has no plans for water developments or other range improvements within the area of the OWCRNA, and thus there will be no effort to move cattle into the area purposely. There are no existing fences in the area, none are needed, and no change in management is necessary in lieu of fencing. Livestock grazing will not be used as a management tool to maintain vegetation communities in the OWCRNA. Maintenance of the current grazing situation on the South Water Hollow allotment will result in an acceptable level of casual or incidental livestock use that can be tolerated within the OWCRNA. Therefore, establishment of the OWCRNA will result in no reduction in numbers or changes in cattle use patterns, and poses no conflicts with grazing management on the South Water Hollow allotment.

Timber

The total forested area of the OWCRNA is about 335 acres (135 ha). None of this is commercial forest. The area that includes the OWCRNA is not included in the timber producing base of the Fishlake National Forest for such reasons as access limitations, wildlife values, and potential regeneration difficulties. Therefore, designation of the OWCRNA will result in no values being withdrawn from the timber producing base.

Watershed Values

The OWCRNA contains no perennial water sources, wetlands or riparian habitats. South Water Hollow and the floor of The Cove contain intermittent drainage courses. Natural erosion of the sparsely-vegetated, steep shaly slopes that flank the lower-elevation margins of the OWCRNA provides a natural source of sediments to surrounding lowlands, especially during storm events. RNA designation should have no impact on the watershed properties of this area.

Recreation Values

Recreation use of the part of the Fishlake National Forest occupied by the OWCRNA is very low, and is especially minimal compared with such use on the rest of the Forest. The area is remote, with poor roads and difficult access.

A few hunters on horseback may traverse the upper-elevation portions of the OWCRNA. The lower-elevation portions of the area likewise receive little hunting use, because the animals being hunted are generally not in that country when the hunting seasons are in effect.

One type of use that is becoming more popular in the region is recreational backcountry horse riding, and the remoteness of the OWCRNA might attract users of this type. Much of this would likely be day use. There may, however, be some interest in overnight use, which would pose a potential future conflict.

Riders of off-highway vehicles may approach the OWCRNA in the vicinity of The Cove, and such use may become more frequent if a proposed access road is constructed to the Convulsion Canyon coal mine from the east, up the Quitchupah Creek drainage from Utah Highway 10. However, the RNA boundary in this particular location is within an area of the Forest that is closed yearlong to all motorized vehicles (see Map 3).

Other forms of recreational use that may occur in low amounts include wildlife viewing, bird watching, enjoyment of scenic vistas, and general exploration of a remote area.

Wildlife and Plant Values

Designation and management of the OWCRNA will maintain suitable habitat for special-status animals and plants that are known or likely to occur in the area.

Special Management Area Values

The OWCRNA does not contain or overlap with any Congressionally-designated areas.

Transportation Plans

There are no transportation plans on the Fishlake National Forest that would have direct adverse effects on the OWCRNA. Conversely, designation of the OWCRNA should have no effect on the Fishlake National Forest transportation system. Most of the RNA is included in an area of the Forest that is closed yearlong to all motorized vehicles (see Map 3). The area along the southern margin of the RNA that is not included in this closure area is very rugged terrain that is not readily accessible to vehicles of any type.

If a proposed access road is constructed to the Convulsion Canyon coal mine from the east, up the Quitchupah Creek drainage from Utah Highway 10, then more four-wheel-drive or ATV traffic may approach the OWCRNA in the vicinity of The Cove. However, the RNA boundary in this particular location is within the vehicle closure area referenced in the preceding paragraph.

The 1997 edition of the National Forest map shows a designated trail (#106) in the bottom of Water Hollow and South Water Hollow, along the northwestern margin of the OWCRNA. As mentioned in the **LOCATION** section of this Record, however, no evidence of an obvious trail was seen in this place by the 1997 field crew. There are no present plans to improve or even maintain whatever trail might exist in this location.

MANAGEMENT PRESCRIPTION

In order to meet and maintain the objectives for which the OWCRNA is established (see the **OBJECTIVES** section of this Record), various management standards and prescriptions will apply to the area. General standards for RNA protection and management are contained in the Forest Service Manual, Section 4063.3. More specific management prescriptions for RNAs on the Fishlake National Forest appear on pages IV-154 through IV-156 of the Forest Plan (USDA Forest Service 1986b); these pages are included in Appendix B of this Record. A synopsis of the management standards and prescriptions for the OWCRNA, drawn from these sources, is provided below.

Emphasis for use of the OWCRNA is on research, observations, monitoring, and educational activities that are nondestructive and nonmanipulative. Management of the OWCRNA will be directed toward maintenance of unmodified conditions and natural ecological processes. Human activities that directly or indirectly modify ecological processes will not be permitted within the area.

Use of the OWCRNA by scientists and educators is strongly encouraged. Special-use permits or cooperative agreements will be used to authorize and document scientific activity. Any public use that contributes to impairment of research or educational values will be discouraged or prohibited. Guidelines for scientific and educational use of the OWCRNA are contained in FSM 4063.33.

Logging activities, harvest of woodland products, fuelwood gathering, Christmas tree gathering, and direct habitat manipulation for wildlife are prohibited within the OWCRNA. The District and Forest should show the OWCRNA as a closed area on firewood and Christmas tree cutting maps that are distributed to the public.

Livestock grazing will not be used as a management tool to maintain vegetation communities in the OWCRNA. Maintenance of the current grazing situation on the South Water Hollow allotment, within which the OWCRNA lies, will result in an acceptable level of casual or incidental livestock use that can be tolerated within the OWCRNA. Construction of range improvements is prohibited within the OWCRNA, and other management actions will not be taken to encourage livestock usage at greater than current levels within or toward the vicinity of the OWCRNA. Overnight pasturing of recreational pack stock is not permitted within the OWCRNA.

Construction of developed recreation sites and establishment of permanent camps are prohibited within the OWCRNA. Use of the OWCRNA by Outfitter and Guide operations will not be permitted. Other recreational use of the OWCRNA is not expressly prohibited, but such use will not be encouraged so that the scientific and educational values of the area can be emphasized. The effects of recreational uses (if any) that occur within the OWCRNA will be evaluated periodically. Any such uses that are found to be threatening or interfering with the objectives for which the OWCRNA was established will be prohibited. Indicators of unacceptable degradation include the appearance of new social trails, creation of campsites, campfire rings, unnatural erosion patterns, and other indications of significant recreational use.

No roads, new trails, fences, signs, buildings or other physical improvements will be permitted within the OWCRNA, unless they contribute to the objectives or protection of the area.

Special closures may be used when necessary to protect the OWCRNA from actual or potential damage from public use, or to prohibit uses that are incompatible with the area's objectives, according to provisions of 36 CFR 261.50 (see also FSM 4063.3.6).

Fire hazard will not be reduced within the OWCRNA. Natural fires within the OWCRNA will be allowed to burn only within the parameters of an approved fire plan, and only under a prescription designed to accomplish the objectives of the area. Until such a plan has been approved by the Regional

Forester in consultation with the Rocky Mountain Research Station Director, fires will be suppressed using means that will cause minimal damage to the OWCRNA. Use of heavy equipment in suppression efforts is strongly discouraged, and should be used only as a last resort. Use of chemical fire retardants in the OWCRNA likewise is strongly discouraged. Fire-caused debris will be left for natural decay, and post-fire rehabilitation is not recommended. If such rehabilitation must be done, as in cases of extreme flood or erosion hazards to people or property outside the OWCRNA, then only seeding with locally adapted ecotypes of indigenous species should be utilized.

No actions will be taken against endemic insects, diseases, wild plants or animals in the OWCRNA, unless the Regional Forester and Station Director deem such actions necessary to protect the features for which the OWCRNA was established or to protect adjacent resources.

Introduction or spread of exotic plant or animal species into the OWCRNA is prohibited, and precautions will be taken to avoid such introductions. Insofar as is practical, measures will be taken to control or eradicate existing or new occurrences of exotic plant or animal species from the OWCRNA, particularly those that readily invade native communities and/or alter natural ecological conditions. If re-seeding is needed following a fire (as mentioned above), then the seed mix will not contain non-native plant species. If pack stock are determined to be a vector for introduction of non-native plant species, then weed-free feed requirements will be implemented.

Where pest management or noxious weed control activities are necessary within the OWCRNA, they will be as specific as possible against target organisms, and will induce minimal impacts to natural values and other components of the ecosystem.

The Forest Plan (page IV-156) calls for withdrawal of the OWCRNA from mineral entry in conformance with section 204 of the Federal Land Policy and Management Act of 1976 (90 Stat. 2743, 43 U.S.C. 1701; FSM 2761). However, failure to achieve such a withdrawal will not be a deterrent to the continued RNA status of the Old Woman Cove area (FSM 4063.2).

Mineral lease applications, permits and licenses within the OWCRNA will be reviewed and processed in a timely fashion, recommending to the Bureau of Land Management such measures and stipulations as necessary to protect surface resources. New leases within the OWCRNA will include the stipulation for No Surface Occupancy.

Vegetation Management

As mentioned above in the **MANAGEMENT PRESCRIPTION** section, domestic livestock grazing will not be used as a management tool to maintain vegetation communities in the OWCRNA.

Fire plays an important functional role in several of the shrub- and tree-dominated communities represented in the OWCRNA. Over time, fire suppression alters the "natural" or pre-settlement fire regime in these communities, and leads to changes in their structure and function. In the long term, continued fire suppression may even convert these communities into types whose response to fire is entirely unpredictable.

Therefore, inventory, monitoring and research should emphasize the role of fire as a natural process governing these communities, and evaluate the risk of continued wholesale fire suppression. Such knowledge should be incorporated into an approved fire plan for that portion of the Forest in which the OWCRNA lies, and allow for conditions under which certain naturally-ignited fires may be allowed to burn within the OWCRNA. Such a plan will identify those parts of the OWCRNA that are allocated for prescribed non-suppression of naturally ignited fires, and those parts that are reserved for permanent suppression of fire (per FSM 4063.41.5.j(1)).

Monitoring

To ensure that only authorized use is occurring and to determine if any threats may be imminent, the OWCRNA should be visited annually or biennially by Forest Service personnel or a cooperative partner. A stewardship monitoring module prepared by the Natural Areas Program Office in Missoula MT is available for use in documenting the results of such general monitoring visits.

Establishment of permanent monitoring plots is encouraged within the OWCRNA. These would provide information required to manage effectively and protect the area over time. Long-term ecological monitoring in RNAs will make significant contributions to understanding of how ecosystem patterns and processes change over time.

ADMINISTRATION, RECORDS AND PROTECTION

Administration, records and protection of the OWCRNA are the ultimate responsibility of the Director of the Rocky Mountain Research Station. The Station Director, in consultation with the Forest Supervisor, Fishlake National Forest, and District Ranger, Richfield Ranger District, will approve all management plans and oversee and coordinate approved research. The Forest Supervisor will execute approved management plans for the OWCRNA and administer, manage and protect the area. The District Ranger has responsibility for direct administration, protection and management of the OWCRNA in accordance with this Establishment Record, Forest Plan management direction, and any subsequent management plans for the OWCRNA.

Requests to conduct research within the OWCRNA are referred to the Station Director, who will be responsible for any studies or research conducted. The Station Director will evaluate research proposals, and will coordinate the activity with the District Ranger prior to the initiation of any project. All plant and animal specimens collected in the course of research conducted in the OWCRNA will be deposited with the Monte L. Bean Life Science Museum and Herbarium at Brigham Young University, and/or with federal agency herbaria and museums approved by the Station Director.

Records for the OWCRNA will be maintained in the following offices:

Intermountain Region, Ogden, UT
Fishlake National Forest, Richfield, UT
Richfield Ranger District, Richfield, UT
Rocky Mountain Research Station, Ogden, UT

ARCHIVING

The Research Natural Area Coordinator at the Intermountain Regional Office, Ogden, UT, will be responsible for maintaining the OWCRNA research data files, including studies conducted in the OWCRNA, lists of plant and animal species and plant communities occurring within the OWCRNA, and lists of herbarium and museum specimens collected. Descriptive data from the OWCRNA will also be stored in the computerized natural areas database maintained by the Utah Natural Heritage Program in Salt Lake City, UT.

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